THE
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JOURNAL
AND
PHOTOGRAPHIC
ENLARGER.
A MAGAZINE OF POPULAR SCIENCE FOR THE LECTURE-ROOM AND THE DOMESTIC CIRCLE.
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NOTICES.

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NOTES.

North Middlesex Photographic Society.—The first special lantern slide competition of this society took place at Jubilee House, Hornsey Road, N., on the 1st ult., the members voting as the slides were projected on the screen, three slides being projected side by side at one time, and in this manner they were gradually weeded out. The winning slide was a charming little view of sea and sunset sky by Mr. A. H. Lisett. This, and several of the better slides shown were selected by the lantern committee in order to form a society set.

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Optical Illusions, etc.—Last month, when lecturing at the Bradford Mechanical Institute, Mr. J. Pike projected, by means of the lantern, diagrams illustrating the methods of producing a variety of optical illusions, such as the production of ghost scenes, etc., at exhibitions. He also discoursed on the subject of light, and illustrated the composition of a beam of sunlight penetrating a darkened apartment. He also projected views showing the structure of the retina, and gave illustrations of the effect of colour as presented to the human vision.

Naked Lights and Acetylene.—Until people become educated to the fact that it is dangerous to open charged generators in the presence of a naked light, so long will accidents from carelessness of this kind take place. A plumber in Paris had an apparatus placed in a shed detached from his house, and one evening, it appears, he went to see to it with a lighted candle, and as soon as he opened it an explosion occurred, the cover of the generator hitting him on the head causing instantaneous death. Acetylene or house gas mixed with air forms an explosive compound, and yet—in the face of explosions reported in the daily and other papers resulting from people looking for leaks with a light, and the fronts of houses being blown out in consequence—there are many who evidently disregard all precautions under such circumstances.

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Clouds Printed-in in Lantern Slides.—Clouds printed-in in a lantern slide generally enhance the beauty of the subject, but at the same time one must exercise a certain amount of forethought. It looks somewhat absurd to see clouds lighted from the right hand, and the picture lighted from the left side. People we know, have been guilty of this; perhaps they will profit by the hint.

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Alyth Board School.—From reports received we learn that the pupils of the Alyth schools have lately had a most enjoyable treat on the occasion of a lecture on South Africa and the Transvaal, lately given by Professor Ramsey, the chairman to the School Board.

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X Rays and the Queen.—*Science Siftings* says: "We learn that the fluorescent lantern and X rays have been introduced into service in the Royal kitchen with much benefit. They are instant and infallible detectives of stray fish bones, plum-stones, and what not, improperly situated in the prepared articles of Royal food. An X ray glance at each 'dangerous' dish, ere it leaves the kitchen, lifts a great weight of responsibility from the cook's mind."

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The Electric Cinematograph was the subject of a lecture by Mr. William Nicholl at the Belfast Natural History and Philosophical Society, at which he traced the development of this instrument from the Thaumatrope, which was exhibited at the Royal Polytechnic in 1835 or 1836. The lecture was profusely illustrated. The supply of electricity was conveyed by cable from the premises of Messrs. Ewart, of Bedford Street.

The December Number of the "Optical Magic Lantern Journal."—In consequence of the quotation from our December number in connection with new discoveries in photography in colour, which appeared in the *Daily Chronicle* and other papers, our publishers have had a tremendous run on this number. In consequence of this, we are requested to state that there are only a limited number left on hand, so that those who yet wish to obtain a copy had better do so at once, ere it is too late.

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Naked Flame Under Water.—A correspondent sends us the following cutting from a daily paper:—"A contrivance for producing a naked flame under water has just been patented. It consists simply of a chamber into which there is led a stream of gas and a stream of oxygen at such a pressure as to overcome the pressure of the liquid," and asks, if the flame is in immediate contact with the water how is the gas ignited? We are not aware that this can be done in the manner our correspondent evidently thinks; perhaps it refers to a lantern in which a gas flame can be burned, and which when lowered under water is fed by a supply of oxygen by means of a tube. Surely our correspondent does not think that the flame burns in a naked form in contact with the water.

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Supply of Calcium Carbide.—There seems to have been some difficulty of late in procuring a sufficient supply of calcium carbide, perhaps by the time the new calcium carbide works at the Falls of Foyers, Inverness-shire are completed, this will be remedied.

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Archdeacon Shears at the Lantern.—In aid of the restoration fund for Shelton Church, a series of lectures was lately arranged by the Rector of Shelton. These consisted for the most part of details of, and slides from, terra-cotta panels by Mr. George Tinworth. Archdeacon Shears, who is said to have one of the finest lantern outfits in existence, volunteered to project the slides on the screen. He used a specially constructed form of the Gwyer jet, somewhat different from the commercial form of this jet, and got an intense light, notwithstanding the fact that many of the slides were somewhat dense. During certain intervals, songs, etc., were given, and we learn from one who was present, that so powerful was the jet, that had it not been for frequent intervals, it is questionable whether Archdeacon Shears could have continued the lantern for any great space of time, as the limes, which were 1¼ inches in diameter, soon got honeycombed with the intense heat. The quantity of gas used including the jet of hydrogen during the intervals, was at the rate of 8 feet of coal gas and 6½ feet of oxygen per hour. The pictures were 20 feet in diameter at a range of 100 feet. For ordinary use the Archdeacon uses the No. 2 Gwyer jet, but the one referred to above was a specially powerful experimental jet.

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Gwyer's Jets at Theatres.—Gwyer's new and powerful limelight jets are now in use at several theatres, amongst them being those in Hull, Bradford, Leeds, Bristol, etc., besides being exclusively employed in a number of travelling shows. We hear of them giving great satisfaction.

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Rather Awkward.—There is one man, so the story goes, who curses long and loudly the cinematograph. In his amiable, husbandly way he took his wife to see the "cin." (new abbreviation), and in the Sunday afternoon disembarkation scene his better half saw what she believed to be her husband coming ashore with another lady. To be the more convinced, she saw the tableau fully half-a-dozen times with the aid of opera glasses. The accused male indignantly denies everything, but as he cannot prove a complete alibi for that particular Sunday afternoon, and his wife won't entertain the idea of an "extraordinary likeness," there is a big storm in the once happy 'ome.

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Rural Districts.—The lanternism of some rural districts is much in need of a rise in quality, although often not in quantity. Even if the upward push is made from the outside the benefit is a local one. Mr. F. J. Scrimgeour and his triple lantern did this small duty to Bervie on the 19th, and the wonderful dioramic effects elicited the remark that the adjective "majic" had in this case been revived.

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A Missing Lantern Outfit.—It had been announced that on the 11th ult., Mr. G. Coffey, M.R.I.A., was to give a lecture in Dublin on "The Use and Abuse of Celtic Ornament," to be illustrated by lantern slides of representative examples and details of Irish ornament. The audience were patiently waiting, and it had finally to be announced that by some evident misunderstanding, neither lantern, screen, nor slides had arrived at the hall. After a general vote, the lecturer briefly outlined the subject and adjourned the lecture for a few days.

Acetylene Gas.

IN our last issue we were unable to make room for the following interesting paper on "Acetylene Gas," which was given by Mr. Harry Smith, F.I.C., before the members of the Insurance Institute of Manchester.

Acetylene, or as it is sometimes called, ethine, has been known to chemists for a considerable period of time. It is said to have been first prepared by Edmund Davy, who described the gas as a new hydrocarbon to which he gave the name of "klumene." He was engaged at the time upon a research which had for its object the preparation of the metal potassium. And on heating a mixture of carbonised tartar and charcoal, he obtained a greyish-brown mass which, when brought into contact with water, **produced the acetylene** in considerable quantities. Davy did not proceed to examine the gas more closely, and it was practically lost sight of for several years, until in 1859 Berthelot rediscovered the gas and gave it the name by which it is now commonly known; he prepared the gas by passing certain vapours such as those of alcohol, wood naphtha, and ether, through red hot tubes, and he very carefully examined the properties of this new body, and was also successful in producing it from its two elements synthetically, by passing a powerful electric current between two carbon points in a glass vessel containing hydrogen gas, when the intense heat of the electric arc brought about the combination of the hydrogen and the carbon with the formation of acetylene gas. For many years, acetylene, although of great interest from a theoretical standpoint, was only produced in comparatively small quantities, and for scientific purposes. But in 1888, the discovery in America by Mr. T. L. Willson of New York, and independently in France by M. Moissau, of a method by which the gas could be **economically produced** in large quantities, placed the matter upon an entirely different footing, and experts all the world over, recognising the great possibilities involved in a new method of production, were speedily at work to determine how best the material could be applied to the uses of every-day life.

The discovery lay in the formation of a substance known as calcium acetylene; or, as it is more frequently called, calcium carbide.

The substance is a hard greyish stone-like material, and it is made by exposing a mixture of lime and coke in fine powder to the intense heat of an electric furnace, under the influence of which the calcium of the lime and the coke or other form of carbon combine chemically with each, and the molten residue consists of calcium carbide. This is removed from the furnace, and when cooled and solidified, is broken up into lumps of a convenient size for use. On placing the carbide in water, acetylene gas is immediately given off, and this is brought about by a decomposition both of the water and of the carbide of calcium, the hydrogen of the water combining with the carbon to form acetylene, and the oxygen of the water combining with the calcium to produce ordinary lime which is left as a residue in the generating vessel.

In the first instance, the most **sanguine opinions** were freely advanced by many as to the ease and economy by which this manufacture could be carried on, and it was freely asserted that the calcium carbide could be made and sold at prices which would immediately sound the doom of the manufacture of coal gas, but these wild estimates have not since been borne out in practice.

The price of the calcium carbide, and ultimately of the acetylene itself are still so high that except in certain cases the gas cannot be obtained so cheaply as coal gas, but the new illuminant is already being very largely employed in this and other countries in places where the former gas cannot so readily be made or used, and for a time at least, the demand for the calcium carbide was so great that it could only be obtained with great difficulty, but this obstacle has been met and overcome, so that the material can now be obtained as it is required.

It may be well to state at this point that with due precautions, calcium carbide may be handled and stored with **perfect safety.** It does not take fire, or explode of itself, but as it is at once affected by the presence of water, it is necessary that it should be properly protected from the action of any form of moisture. A lump of the carbide exposed even to the moisture of the atmosphere will speedily be acted upon, and the peculiar smell of the acetylene, which is generated thereby, may be readily perceived. The chemical action which is set up when water and calcium carbide are brought together is attended by great heat, and it is possible that in presence of a limited supply of water the carbide might **become red hot;** to guard against this danger, the calcium carbide is packed and stored in air-tight iron drums, and so far I am not aware of any accident having occurred from this cause.

During the last few months, however, several very serious and fatal accidents have been brought about by the use of acetylene, and a great deal of uneasiness has been felt by the users of the gas, for although the advantages of this new illuminating agent are great, yet it is felt that these would not induce the further development of the system, if there is also a latent possibility of such deplorable occurrences as have been recently recorded.

I propose to lay before you the details, so far as they are known, of the **accidents** which have already occurred, and the conclusions which are to be drawn from them as to the comparative danger, or safety from fire or explosion, where acetylene is employed for lighting purposes, and first of all it may be useful to consider briefly the properties and character of the gas itself.

Acetylene is a colourless gas composed of twenty-four parts by weight of carbon, and two parts by weight of hydrogen. It has a peculiar and disagreeable smell which is much intensified by the use of carbide containing impurities such as phosphorus, which is derived from the coke or lime used in the manufacture; it is stated by Professor Vivian Lewes that these impurities are more frequently met with in carbide manufactured on the Continent than in that made in England, as the ingredients which are employed here are **carefully selected,** and if more than a mere trace of phosphorus is present, these materials are rejected as unfit for the purpose. The precise danger lies in the fact that carbide containing certain phosphorus compounds will give off a gas called phosphuretted hydrogen along with the acetylene, and as this gas is spontaneously inflammable in presence of air, it constitutes a certain grave risk when present in any quantity. The peculiar smell of acetylene constitutes a valuable safeguard in itself, as the presence of any leakage from breakages of pipes or defective joints is at once detected, more readily in fact than a leakage of coal gas. Acetylene, like coal gas, produces an explosive mixture with air, but recent experiments show that it is only explosive over a slightly wider range than coal gas. In a paper on this question read before the British Association at Liverpool, last autumn, Professor Frank Clowes detailed the results of some investigations which he had carried out, and he showed that air must contain **three per cent. of acetylene** before it can be kindled by a flame and the mixture caused to burn throughout. As the proportion of acetylene is increased the explosive character is augmented. When 22 per cent. of acetylene is present, carbon begins to separate during the burning, and the amount of carbon which separates increases until so much acetylene is present in the mixture that the explosive character disappears; this point is reached when 82 per cent. of acetylene is present in the air. The limiting percentages in air which are explosible are accordingly as follows:

Acetylene ..	3 to 82 per cent.
Hydrogen ..	5 to 72 ,,

As coal gas is largely composed of hydrogen and hydrocarbon gases, it is evident that the acetylene has very much the same degree of explosibility, when mixed with air, as coal gas itself. As will be shown further on, the burners which are used for acetylene pass only about one-tenth of the volume of the new gas in a certain time as is passed by ordinary coal gas burners, so that the risk arising from taps being carelessly left open would be considerably less where acetylene is used, as it would take so much longer for the atmosphere of a room to be brought to the condition in which it would become explosive. Professor Clowes produced a piece of apparatus which allows of the detection and estimation of varying quantities of acetylene when mixed with air. The method is somewhat similar to that employed in coal mines for the detection of gas where a "cap" of pale blue flame is observed above the normal flame of a lamp when gas is present. A small hydrogen flame set to either 5 or 10 millimetres in height, as may be necessary, shows a pale but well defined "cap" in air containing any proportion of acetylene less than the lowest explosive proportion. When a quarter of a per cent. of acetylene is present, the "cap" is 17 millimetres in height over a 10 millimetre flame; with half a per cent. it is 19 millimetres, with one per cent. 28 millimetres, and with two per cent. of acetylene the "cap" is 48 millimetres in height.

Acetylene, when burnt, produces an intensely **brilliant light.** This will be readily understood when it is said that coal gas, which contains about 90 per cent. of non-luminous gases, such as hydrogen, marsh gas, and carbonic oxide, owes its illuminating power to the remaining portion of hydrocarbon gases, such as acetylene and other similar bodies. Owing to its richness in carbon acetylene as an illuminating agent can only be employed in special burners. These, as a rule, supply about ½ to 1 cubic foot of gas per hour. If more than this is passed the flame will begin to smoke freely.

According to Professor Vivian Lewes, all acetylene **burners begin to smoke** after being in use for a certain length of time, which may be some hundreds of hours. This, he points out, is due to the fact that the holes in the burner are so exceedingly minute, and that after a time they get partially obstructed.

Burners passing more than 1 cubic foot per hour would yield so intense a light as to be practically unuseable for purposes of domestic illumination. Using a burner which supplied 1 cubic foot of acetylene per hour, an illumination equal to that from thirty standard sperm candles was obtained, and this is equal to fifteen to thirty times as much light as can be derived from ordinary coal gas.

One very valuable feature in connection with the new gas is that where it is used there is far less vitiation of the atmosphere than is the case with coal gas. This, of course, is owing to the fact that, for a given illumination, a far greater volume of coal gas requires to be burned than is the case with acetylene. And with a good quality of acetylene, generated from carefully prepared calcium carbide, this results in a great improvement of the atmosphere of dwelling-rooms; with flat flame No. 4 burners, for instance, giving an illumination with coal gas of forty-eight candles, more than five times as much carbonic acid would be produced and poured into the air of a room than would be given off by acetylene burners yielding the same amount of light; and another point of interest is, that although acetylene burns with a very hot flame, yet owing to the small number of lights required, the temperature of the room is not so greatly increased as when coal gas is the illuminant in use.

These facts go to show that at any rate the consumers of acetylene should derive certain **benefits** on the score of health.

As to the mode in which the gas should be generated, much has yet to be learnt, and great improvements will, no doubt, be effected in the future as to the mechanical arrangements for its production; at the present time there are many different forms of generating devices upon the market, some of which are no doubt faulty both in design and construction. Further experience will show the best form of appliances to be used. At present the best plan is apparently to obtain the apparatus and materials through well-known and **respectable firms,** whose care for their own reputation lead them to supply only such appliances as are thoroughly well made and tested before being sent out from their works. In fact, the ease and simplicity with which the gas can be manufactured have already led to at least one accident, which probably would not have occurred at all had the apparatus been of a more reliable nature.

There are at present two methods by which acetylene may be obtained for use. The first is to employ an efficient generating apparatus, and to charge it as required with the proper quantity of calcium carbide and water. The second method is to procure compressed acetylene from manufacturers in steel tubes, and to attach one of these tubes to a regulating apparatus and the services pipes. As to the latter method, acetylene gas can be compressed into a liquid form at the temperature of the freezing point, under a pressure of 21½ atmospheres, or about 320 lbs. to the square inch, but at higher temperatures the pressure in the cylinders increases tremendously; at the ordinary temperature the pressure is twice as great, whilst at temperatures of 90 to 100 degrees Fahrenheit, the critical point is reached, according to Villard, and above these temperatures acetylene can no longer exist in liquid form.

Liquid acetylene is not only explosive when allowed to expand again into gas, and mixed with the necessary quantity of air and ignited; it is also possible for it to decompose into its constituent elements, carbon and hydrogen, and as this decomposition is attended by great heat, the pressure is thereby enormously increased. Nevertheless, M. Pictet, whose work in connection with the liquefaction of gases entitles him to speak with great authority, held the opinion a short time ago that if the liquid acetylene is absolutely pure it is deprived of its dangerous qualities. And according to the *Engineer*, if that be so, his theory, as well as that of other experts, is shaken by the fact that one of his receptacles should have exploded. The gas is liquefied in a Cailletet cylinder under a constant and uniform pressure, a condition which is held to be indispensable for transporting acetylene over long distances. These cylinders are made of nickel steel, and are tested up to 250 atmospheres. The material used is so tough that a cylinder having a capacity of twelve litres, or rather more than 2½ gallons, does not weigh more than twenty-two kilogrammes, or about 48½ lbs. In a receptacle of this capacity it is only possible to put about 8¾ lbs. of liquid acetylene, as some allowance has to be made for its enormous expansion.

M. Pictet has had the idea that these cylinders would be sold in all the stores, and would be **taken home by the consumers** and, after being fixed to a regulator, would be connected by pipes with the burners. The pressure in the cylinders would be sufficient to force the last drop of liquid into the regulator, where it would be volatilised.

It was a receptacle of this description, though of much larger capacity, that exploded in the works in the Rue Championnet. In the form of a steel shell, it was about a metre in length, and had an aperture of only three millimetres (which was closed with a screw plug). No one knows the exact state of the cylinder, but it is presumed that it must have been full at the time of the explosion which took place in M. Pictet's works in Paris, a part of the works was blown down, two workmen were killed and another injured, and not a pane of glass was left in the windows of the large block of buildings, the unfortunate workmen being torn to pieces and parts of their bodies scattered about the yard. The explosion is believed to have been caused by one of the men closing the screw plug and then trying to open it again. A few minutes before the accident, a man from the engine-room, close by, entered the gas-holder room and saw one of the **deceased workmen** screwing down the plug, and as a spanner was found among the dêbris it is presumed that he tried to unscrew the plug by this means, during the process of which he overheated the metal to an extent sufficient to ignite the liquid. The following note on the explosive properties of acetylene has been recently presented to the French Academy by M.M. Berthelot and Vieille, who state that in acetylene at ordinary pressures neither an electric spark, or flame, nor an explosion of a detonating material such as a fulminate, will cause more than a local dissociation of the gas (a fact already established by Professor H. B. Dixon of this city), but that if the gas be compressed beyond two atmospheres, the dissociation, once started, is propagated without sensible diminution throughout the whole quantity of gas. In this way, dissociation of the gas was effected in a tube twenty millimetres in diameter and four metres long. The **acetylene splits up** into pure hydrogen and a friable mass of carbon, which forms a cast of the containing vessel, and can be withdrawn intact. At a pressure of 20 atmospheres, which is about half the tension of the saturated vapour of liquid acetylene at twenty degrees C., the explosion develops a tenfold pressure, but the rate of propagation is much below that of the true explosive wave of such a mixture as electrolytic gas, that is to say of gas prepared by decomposing water with an electric current into its elements, oxygen and hydrogen gases.

As the temperature due to the explosion increases with initial increasing compression, it was to be expected that liquid acetylene would exhibit the character of a "high" explosive. This M.M. Berthelot and Vieille have shown to be the case. Eighteen grammes or rather more than ½ ounce of liquid acetylene, exploded in a steel bomb by a hot wire, developed a pressure of 5,564 kilogrammes per square centimetre. This corresponds to an explosion pressure for the liquid alone of about 9,500 atmospheres, a value approaching that of gun cotton.

(*To be continued.*)

The Largest Lantern Audience.

PROBABLY the largest and most distinguished audience that listened to any lantern lecture was on the occasion of Dr. Nansen's discourse before the Royal Geographical Society at the Albert Hall on the 8th ult., when he gave a graphic description of his travels in the far North.

What Dr. Nansen said has been fully reported in the daily papers, also the particulars of the speech by H.R.H. the Prince of Wales when he presented Dr. Nansen with the Society's gold medal. As our readers will probably be interested in a few particulars pertaining to the lantern manipulations, we have pleasure in stating that the society and Dr. Nansen selected as their lanternist Mr. C. W. Locke, and certainly they could not have had a more experienced operator. A stout rope of 2½ inches in circumference was stretched across the hall by means of pulley blocks immediately in front of the great organ; on this, stout rings were fitted which carried a screen 37 feet 6 inches square, and even this in such a huge building did not look its size. It may be of interest to know that the raw material for this screen cost Mr. Locke between £8 and £9.

During the introductory part of the lecture, the screen, gathered together, hung as a white strip, and on an electric signal from the lecturer, Mr. Locke, by a series of unobtrusive hand signals, gave his instructions. At the first the cord round the bottom of the screen was undone; on the second the screen was drawn across the rope; on the third the screen was rendered taut by fastening the corner ropes to rings in the floor, and on the fourth the lights were put out. All this was effected with great smoothness in a surprisingly short time, the lecture going on meanwhile.

The lantern was placed in the Duke of Wellington's box on the first tier, and was 167 feet distant from the screen, which the pictures filled, leaving only a very few inches of margin.

At such an important demonstration as this the slightest hitch would have spoilt matters, and it was interesting to see the great precautions taken by Mr. Locke to guard against such. The oxygen and hydrogen cylinders with fittings were in duplicate, and at a moment's notice the extra set could be switched on, should such be necessary. Duplicate warm condensers were also in readiness in case of breakage; although no such duplicates were required, it showed due caution on the part of the operator. The light, which was obtained by Mr. Locke's new patent jets, was most brilliant.

At the termination of the lecture, and before the presentation of the medal to Dr. Nansen, the signals were again gone through, and in a moment or so the hall was illuminated, and the screen hung, as at first, in a strip at one side of the building, and brought to a close one of the most important, unique and successful lantern lectures of modern times.

Prominent Men in the Lantern World.

No. V.—Mr. CHARLES E. RENDLE.

UNDER this heading, in our previous chapters, we have so far only mentioned those whose business has been entirely in connection with the sale of apparatus pertaining to the lantern. No less prominent are many whose hobbies are connected with projection, and who, by various teachings and suggestions, have endeavoured to bring the lantern to a higher state of perfection.

For several years past our readers will have become acquainted with the articles which have been contributed from the pen of Mr. C. E. Rendle, and when one reads an article, there is often a strong wish to mentally picture what sort of looking party the writer may be. In Mr. Rendle's case they will now be able to satisfy any curiosity they may have, as we here reproduce a recent portrait of him.

When asked when he first began to take an interest in the lantern, he at once confessed to us that he really could not say, he seemed to have been taking a keen interest in it as far back as he could remember. "And as to photography," he said, "it was on my thirteenth birthday that I took my first lesson. My father had arranged with a Manchester photographer to put me through my facings, and the pleasure I felt in carrying home my first attempts in the form of a positive picture of Mr. Collodion himself, I well remember. The study I have followed all my life, though but an amateur, the only profit ever derived being to my own stock of lantern slides."

From his earliest days the all important object at heart with him seems to have been a thirst for knowledge. Articled to a firm of manufacturing goldsmiths in the west of London, he soon won the pseudonym from his fellow-apprentices of "Old Dictionary," owing to his studious habits, and the fact that he was seldom without a small dictionary in the pocket of his blouse. Whilst in this house of business, where he remained sixteen years, opportunities were offered for the study of mechanics in their several departments. He had much to do in executing articles of jewellery, and knick-knacks for many a royal wedding or court festival. He further went in for the science of Horology, at the Horological Institute, of which he was a member. At the age of eighteen, he became associated with the Birbeck Institution, where he studied music, chemistry, literature, and elocution, having such—future—luminaries for his co-students as Arthur W. Pinero, William Fitzhenry, Tom E. Gatehouse, Mary Jeffries Lewis, and many others.

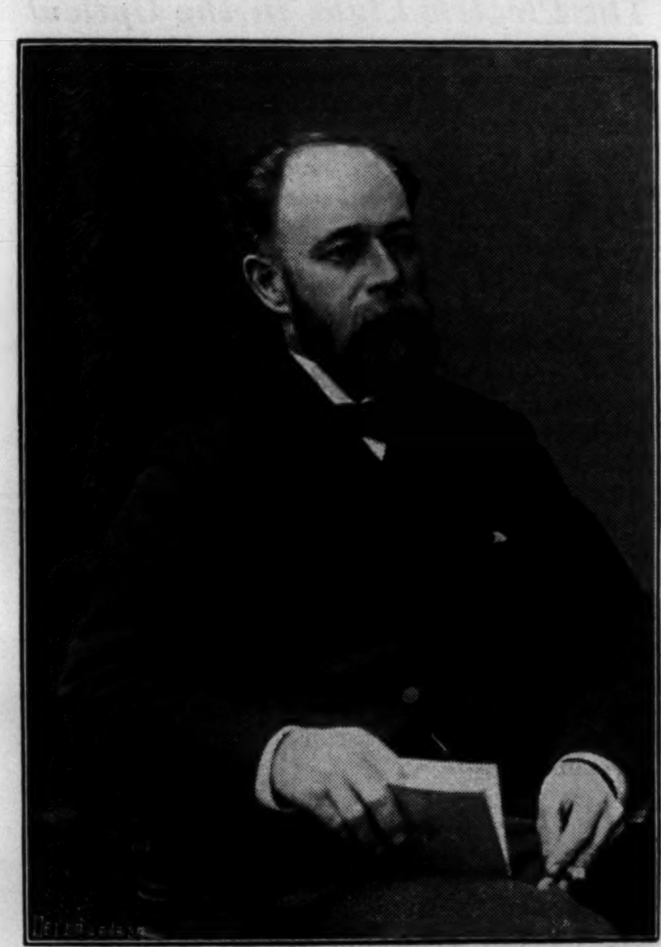


Photo by J. Hubert,] 1896. *[Mare St., Hackney*

In 1870, he passed the examination for elocution, under the late Professor Plumtre, of King's College, and was awarded the certificate of the first class. At the Birkbeck he held office as one of the class secretaries for the long term of ten years, during which period he was the recipient of two handsome testimonials, each being accompanied by a framed address, bearing testimony to his usefulness and energy. From the first of these we quote, "His untiring perseverance, and the unostentatious manner in which he performed his duties, gained him the universal esteem of the entire class." Christmas, 1873. And from the second, on his retiring from the secretaryship in 1878, "As a mark of our esteem, regard, and recognition of his services, and arduous endeavours at all times to secure our comfort and happiness at the Birkbeck Literary and Scientific Institution."

Following in the elocutionary groove, in 1872 he accepted an invitation from the committee of the institute of St. John's, as master of the elocution classes, which position he held for four years. In a testimonial to him, the President, Rev. J. J. Coxhead, M.A., of School Board fame, said: "He is an excellent elocutionist of correct pronunciation, and free from mannerism of all kinds."

He was a student for two years at the British Musical and Dramatic Institute, the manager writing: "He has won for himself the highest marks of public approbation, which on occasions reached the greatest enthusiasm." About this time, Mr. Charles Warner wrote him: "Your powers are of no mean order. If it is your intention to adopt the stage as a profession, and I can be of any possible service to you, I am at your command." Truly a tempting offer.

Between 1870 and 1880 he seems to have been a very busy man, according to the portfolio of credentials, programmes, and criticisms before us, and from which we cull one week's engagements, which will convey some idea as to the demand on his services:—Monday, Hospital for Paralysis, to fill in half-hour; Tuesday, lantern lecture, St. Mary's, Paddington, 7.30, 1½ hours; Wednesday, Birkbeck, entertainment at 8, two hours; Thursday, City of London College, at 8, monological musical, etc., two hours; Friday, at 7, rehearsal of "Athalie," Concordia Society, and 8.45, Royal Polytechnic, entertainment, 1½ hours; Saturday, at 2, British Museum Reading Room. He has also been presented with the Cambridge University certificate for proficiency in the chemistry of "Air and Water." Mr. Rendle's "Excursions by Limelight" are highly appreciated and welcomed wherever they have been given, due, as his critics say, to the "natural and homely accomplishments of the entertainer. They can scarcely be classed as lectures in a strict sense, intermingled as they are with song, anecdotes, and story. Songs, the quiet drollery of which is irresistible; anecdotes of pathos, contrasting with a happy intermixture of humour, which serve to exhibit his skill in either phrase of his subject; and stories of individuals whose various eccentricities give scope for voice, gesture, and mimicry. And in these Mr. Rendle is very successful, his voice being clear, his style easy and natural." His pictures we need hardly add are for the most part works of art.

Some time ago he gave a series of articles in our columns in connection with instructions for building a bi-unial. This was written at the time he was himself making one for his own use. We have since seen the completed instrument, and must say it would put to shame several so-called makers of lanterns, all the work having a specially good finish; but then he can hardly be considered an amateur in mechanics, as the above particulars go to show.

Some little time ago Mr. Rendle commenced a series of chapters in our columns termed the "Lanternist's Practical Cyclopædia." This seems to be just one of the kinds of information that was required, and many are the letters which we have received in connection with this, from one of which we will quote. It is from Staff-Sergt. A. J. Lawrence, P. F. Artificer, A.O.C. Gibraltar: "It is always a great pleasure to me every month to receive the MAGIC LANTERN JOURNAL, which to me is always so full of useful and practical information, which is so much to us here. I feel I must congratulate you for publishing the 'Lanternist's Practical Cyclopædia,' by your able writer, Mr. C. E. Rendle. He will have our hearty thanks for his articles, as they are just what is wanted, especially by those whose experience has been limited with the lantern. It will prove a boon to many here in Her Majesty's Service, who manage to do a little with the lantern."

We have now said enough to give our readers some little idea of Mr. Rendle, to which we will merely add that, although of a somewhat retiring nature, he is splendid company, and one can always feel after a conversation with him that something has been learned; also that he has a charming wife and two growing sons. In the company of this family, it has often been pleasure to ourselves and family to spend a most enjoyable evening.

* * *

The Electric Light in the Optical Lantern.—No. V.

By CECIL M. HEPWORTH.

THE term by which we measure the pressure of electricity—it is also called potential or electro-motive-force (E.M.F.)—is the "volt." The stream or current is reckoned in "amperes." The power to do work which is represented by a current of so many amperes at a pressure of so many volts, is found by multiplying the two together, when the result is called so many "Watts." Thus, ten amperes at an E.M.F. of 100 volts—the pressure at which electricity is generally supplied commercially to the consumer—is estimated as 1,000 Watts. Another name for the same thing is a "Kilowatt," and this quantity has been adopted by the Board of Trade as their "Unit." Just as the gas companies reckon up your gas bill at so much per thousand feet, so the electric people charge their customers according to the number of "units" they have absorbed.

But there is another aspect of the question to be considered before we have done with the water simile. Before we can make our stream of water as pumped out by the engine do work for us, we must convey it to the point where the work is to be done by means of tubes, and we must also provide it with a return path to the pump after the work is accomplished. These tubes must be proportional in their internal diameter to the quantity of the water, or the stream will be unduly diminished if they be too small, and a large amount of the energy will be wasted before it reaches the scene of action. Also, the thickness and strength of the walls of the tubes must be proportional to the pressure on the water, or it will escape and be lost. In any case there will be a certain amount of loss owing to the friction on the stream of water by the walls of the tube in which it is conveyed, and this friction or "resistance" will be proportional to the roughness of these walls, or the material of which they are composed, and also to the length of tubing.

It is the same with electricity. The amount which will pass around a given circuit is in direct proportion to the pressure which drives it—measured in volts—multiplied by its quantity or current—measured in amperes—and inversely proportional to the sum of the various resistances which it meets with on its journey. Electrical resistance is measured in "ohms" and the ohm is interchangeable, as it were, with the volt and the ampere.

There are three factors, therefore, in every electrical circuit, through which electricity is passing, and if you know two of them you can find the third by the simplest deduction. Thus, if there be a total resistance of five ohms in a circuit in which the dynamo or other source of electricity is creating a pressure of 100 volts, you may be absolutely certain that the current is no more or less than 20 amperes.

Here is a simple little formula—the invention of some American genius—which is easy to remember, and which puts the whole thing into a nutshell.

$$\frac{E.}{C.R.}$$

E. stands for electro-motive force or voltage; C. for the current in amperes, and R. for resistance, which is measured in ohms. To use this ingenious device, when you want to find one factor, the other two being known, you place your finger over the letter which represents the unknown quantity and multiply or divide the others with one another, as indicated by their position.

Now let us see what all this means **to the lanternist.**

In the first place it requires a certain minimum pressure of electricity before an arc can by any means be made to form between the carbon points. There is, as it were, a certain amount of resistance in the arc which must be overcome and subdued before you can do anything. After that, any increase in pressure will serve to drive a proportionately larger amount of current across the space between the carbons, and the quantity of light emitted depends upon the amount of current that passes. Twenty-five large Grove battery cells will yield a fine arc light, and one might suppose that twelve similar cells would give a light of nearly half the brilliancy. But it is not so, for the potential of twelve such cells falls far below the limiting number of volts, and no arc at all can be established.

An arc light for lantern work, where the lamp employed is one of good and efficient make, so that the greatest possible amount of the total light which it yields finds its way through the system of lenses, a current of ten amperes will give a brilliant illumination far surpassing that of even the best limelight jet. Now the resistance of the arc when running at about ten amperes—for in this one case the resistance varies with the strength of the current—is approximately three ohms. If such a light is to be run upon a 100 volt circuit, where the wire "leads" are so sufficiently large, as they usually are, that their resistance need hardly be taken into consideration, an artificial resistance of 7 ohms will have to be included in the circuit in order to cut down the current to the required ten amperes.

It will be seen that as the quantity of current that flows around a circuit is directly proportionate to the pressure divided by the resistance, if there be not sufficient of the latter, you will get a far larger current than you will know what to do with. For instance, if on a hundred volt circuit you only have a resistance of one-tenth of an ohm, directly you switch the current on you will have a rush of electricity of one thousand amperes, and that will require a copper wire one inch in diameter to carry it properly. If you attempt to send an electric current through a wire that is too small to convey it, that wire will get so hot that it will probably be melted before you have time to switch the current off again. It might easily happen, and indeed it often does, that owing to the wires **accidently touching one another,** the resistance of the circuit becomes in a moment reduced far below its proper amount, and the consequence is an immense flow of current that—were it not for a certain safety device—would speedily melt up the wires, and probably set the place on fire. It is to obviate these disastrous results of an accidental "short circuit" as it is called, that the supply companies always put a "fuze" on their leads when they bring them into your house, and they lock it up so that you cannot get at it.

A "fuze" is a very simple device. It consists merely of a short piece of tin wire, of a thickness proportional to the maximum current that it will be required to carry, which, owing to its easy fusability, immediately melts when more than the normal current passes through it, and dropping out from its terminals, automatically cuts off your supply of electricity.

(To be continued.)

Doing up Tin Lanterns.

By F. R. SMITH.

WITH very few exceptions these are not the days of tin lanterns, but there are some still purchased, and there are certainly yet swarms in existence.

From one cause or another the black varnish comes off in flakes, leaving unsightly patches. Many may think that these can be repaired with little trouble with almost any black kind of paint, enamel, or Brunswick black, but this is a great mistake. True, the white patch can easily be restored to blackness, and may look very well so long as the lantern is not used, but light it up, and the heat causes a most unpleasant smell to arise. What then is the best material to employ? I have found that lampblack and lacquer is the best, and when thoroughly dry give a coating of copal varnish.

* * *

How to Choose an Acetylene Gas Generator for Lantern Work.

By R. MOSS.

THE rapidly increasing demand for acetylene gas as an illuminant for the lantern, leads me to think that a few words about the principles of some of the generators which are made and obtainable in England might prove a welcome addition to the already large store of information provided by the OPTICAL MAGIC LANTERN JOURNAL.

As there are probably many readers still ignorant of the nature and properties of the gas, I will preface my general remarks by repeating what has already been stated in these columns. Some two years ago a Canadian chemist, named Wilson, discovered that when carbide of calcium was brought into contact with water an inflammable gas was produced, which burned with intense brightness. This gas, called acetylene, is a rich hydrocarbon, being composed of two parts carbon and two parts hydrogen, $C^2 H^2$. It is this unusually large proportion of carbon, considerably exceeding that present in coal gas, which gives to this gas when burned such extraordinary illuminating power, in quality and colour very closely resembling that of daylight. This latter feature, in particular, renders it most suitable for lantern work, no unnatural or unexpected tints being imparted to the slides; while its brilliancy as an illuminant is almost, if not quite, equal to the blow-through jet. I have found that with two 0000 burners, and a small circular reflector of suitable curvature and focus, the illuminating capacity works out at from 220 to 250 candle-power. Carbide of calcium, or calcium carbide, as it is more generally called, is now produced by fusing lime and coke in the intense heat of an electric furnace, and is obtainable in this country at very moderate prices, varying from 5d. to 8d. per lb., though some few firms supply it at very much lower rates for use in their own generators only.

And now to business—viz., to give some general idea of the principles upon which the apparatus for producing and controlling the gas are constructed, with a few suggestions as to the necessary qualifications in a generator for lantern illumination.

Lanterns are mainly used under one of two **general conditions**—fixed, that is always in the same building; or moveable, that is to say, used here, there, and everywhere as opportunity arises. In the first case, any generator can be used, provided, of course, that it is of sufficient power, for it can be fixed in a certain spot, and the gas conveyed through pipes as with ordinary coal gas; but travelling about necessitates the smallest possible apparatus, yet one that can be located close to the lantern with safety.

To bring the carbide into contact with water and produce gas is a simple matter; to convey that gas into a bag or holder is also easy enough, but such an arrangement would be out of the question on two grounds:—A holder which would contain sufficient gas would be too large and clumsy to take about, while there would always be some risk in the presence of such a large quantity of a so finely divided and volatile gas as acetylene.

Some apparatus must therefore be used which will generate a certain amount of gas, and then by some automatic arrangement cut off the supply when this quantity has been produced, but allow more to be made when part of this has been consumed. There are practically only three methods of bringing about this result.

1. By dropping water upon the carbide, and providing a tap or valve which checks the flow of water when a certain amount of gas is within the holder; this tap or valve to be automatically re-opened when gas is consumed.

2. By dipping the carbide into the water and withdrawing it when a certain amount of gas has been given off.

3. By keeping the carbide fixed, and causing the water to rise up to it and recede from it by the pressure of the gas itself. As I intend to write only of what I know and have practically tested, I will pass over the first plan, simply stating that I do not believe in it; automatic taps, valves, ball-cocks, or similar mechanical devices being a necessity, and they are all more or less complicated and liable to get out of order; therefore, as the first essential of any apparatus for producing such a dangerous element as gas should be simplicity, especially for lantern work, which is mainly in the dark, I pass on to No. 2.

Fig I

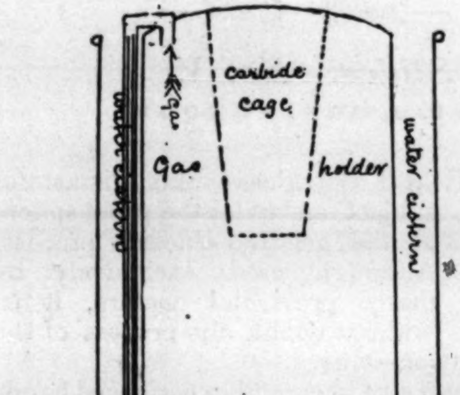


Fig II

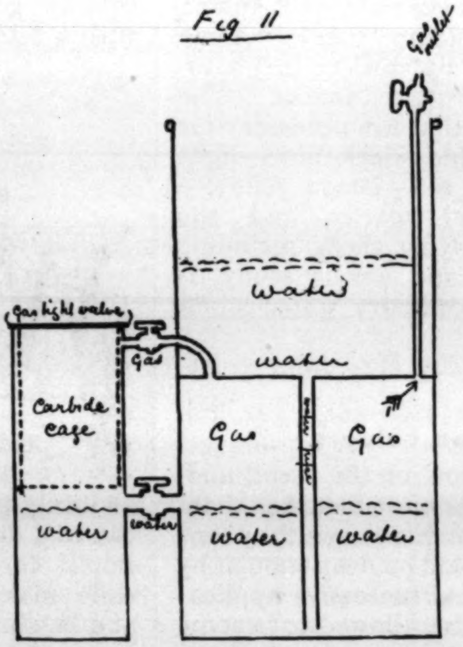
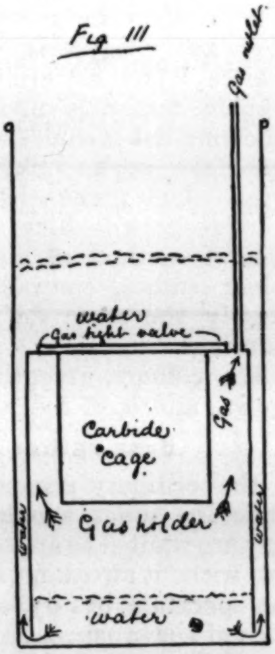


Fig III



Nothing could possibly be more simple than this arrangement, Fig. I. It consists only of a water tank and an inverted cylinder, practically a gasometer on a small scale: a small basket of open wire-work being secured to the top of the gasometer. The cistern is nearly filled with water, the basket charged with carbide, and the gasometer placed upon the guides; by turning a tap, the air is allowed to pass out, and in consequence the gasometer descends into the water—like a diving bell—until the carbide touches the water, when gas is produced; on the tap being turned off the gas generated causes the gasometer to rise, until the carbide is above the level of the water, when no more gas is given off. Consumption of gas allows the gasometer to fall again, until the carbide once more touches the water; this process is repeated until the carbide is exhausted.

By bringing the water up to and withdrawing it from the carbide. There are practically only two systems of doing this, which may, for the sake of distinction, be called high and low pressure, but in reality in both cases the pressure can be increased or reduced by varying the quantity of water present above the carbide. The first of these systems has two containers, one above the other, a tube reaching from the centre of the horizontal division nearly to the bottom of the lower vessel, forming the connection between them; the carbide is placed in a separate container at the side, connections for gas at the top, and for water lower down being provided by pipes, fitted with taps; of course, suitable provision is made for re-charging, condensing, etc., but I will not detail them here. Fig. II. represents this arrangement. The lower cistern is filled with water, also part of the upper, according to the pressure required, the charge of carbide is placed in the smaller vessel or generator, the tap is turned on to allow water to reach the carbide from below. The gas given off passes through pipe into the upper part of lower water tank, which becomes the gas-holder; as two elements, such as water and gas, cannot occupy the same space at the same time, and as gas will not pass down through the water, the latter is forced through the only channel available, viz., through the pipe into the upper cistern, until the level of water in the lower is below that of the carbide, when the production of gas ceases, to be resumed when some has been consumed, the operation being repeated until the carbide is exhausted.

(*To be continued.*)

Colouring Lantern Slides.

LANTERN slides, says Major W. H. Coughlin, should be tinted rather than coloured, and preferably with certain liquid aniline colours because of their beautiful transparency. Suitable kinds are kept by dealers in artists' materials, and known as "Egyptian colours" or "Acme colours," and sometimes by dealers in photographic materials under other names. The following list includes all that are necessary for first-class work:—Sky blue—dark blue—light green—dark green—light red—lemon yellow—orange—brown—lilac—and scarlet, and the general method of employing them, including colour values, contrasts and colour study, is exactly the same as in ordinary water-colour painting.

The colours, excepting sky blue, faint green, brown, and light red, are **dyes rather than colours,** in the ordinary acceptation of the term, and, while the slides should be tinted darker than they are wanted to appear on the screen, they cannot, without streaking, be laid on deep enough by one operation, but by several successive applications of the brush, each being allowed to become *nearly* dry before the application of the other. But, although the tints must be darker than they should appear on the screen, they should only be deep enough to be effective, or give due effect to the natural colour of the subject.

The sky of the slide should be perfectly transparent before colouring, coloured a suitable blue, and clouds picked out in white, and cloud shadows made by the application of a grey tint of sky blue, red, and faint yellow. The colours of distant hills are given by a more intense shade of the same mixture.

In colouring trees the whole object should be tinted green, which as purchased will be found too intense, and must be reduced with lemon yellow, and while moist the shadows touched in with a reddish purple. Before beginning to apply colour the slide should be moistened with a wet brush and allowed to become *nearly* dry, as this makes the application easier and prevents streaking. As most of the colours are readily decomposed by ammonia, clouds may be put in and errors corrected by its application.

The slide is supported on a suitable easel, film side off, and a gelatine-coated cover laid on it, gelatine side out. A few drops of water may be placed between to produce optical contact.

The cover is then treated just as if it were the slide, and when turned face to face the register is, of course, perfect. Major Coughlin (says the *American Amateur Photographer*) gets his gelatine-coated covers by soaking ordinary slide plates in a solution of hypo; but, of course, the economical amateur will make them much cheaper and equally good by coating ordinary thin glass with a filtered solution of gelatine.

Slides.—No. V.

By F. J. SCRIMGEOUR.

WE will now leave this distasteful subject, and enter the great sphere of the gelatino-chloride process. Although used exclusively by many provincial dealers, it is, without doubt, the process of the ardent amateur.

It can give in careful experienced hands as lovely positives as one may wish to see, but it can and does yield results too awful for description if care or experience are wanting. Each slide maker has his favourite brand of plate, and he should most decidedly stick to it. There is a great temptation to go wandering about among the various makers' "specials" and "slows."

One sees a testimonial from some unknown exhibitor which says that the medal now hanging with a blue ribbon round the writer's neck ought by rights to be adorning the breast of Mr. So-and-So, to the qualities of whose plates alone is due any beauty the writer's prize slides may possess.

And we command our dealer to order for us immediately half a gross of those wonderful lantern slides.

They come, but the medals don't!

To succeed in the first place, choose deliberately one well-known series of "slow" plates, and another series of the "rapid" order. It is sometimes best to let both series be from one maker, for then the peculiarities of the one may form the characteristics of the other. And what a

fascination there seems to be

about a new developer! Some brother amateur announces (in print or otherwise) that by adding 2½ grains of what-you-may-call-it to the No. 1 solution of the Gold Medal Company's developer, he has got "Oh, such a lovely tone," an indescribable purple-orange-sepia tone which cannot but captivate the hearts of all judges with any sense of the artistic.

Very few of us can resist the temptation to fish for this charming tone with the 2½ grains of what-you-may-call-it!

Most likely we get only an alarming amount of "muddy shadows," and "fogged high lights," so we empty the adulterated No. 1 down the sink and fume away the rest of the evening in idleness.

Therefore, in the second place, I think it is best to treat the swarm of developers as you did the army of plates, and after choosing one good formula, stick to it. Learn by experience exactly what it can do, and how it does it.

One great

secret of success

in this branch of photography is to let much of the variation, which your negatives will require, be made in the exposure.

Too great care cannot be taken in this the most important part of the process, and the part which contributes most to the qualities of the resulting slide.

Everything does not depend on the number of seconds you expose the lantern plate, but a very great deal does, and if you manage that part of the business correctly, the final stages should present little difficulty. Toning is too large a subject to enter into here, but in this matter also, I am of opinion that one good formula is sufficient for the wants of any ordinary human being. I have wandered myself, I have friends who have wandered—I have read about people who have friends who have wandered—the people themselves never seem to have erred in any way—and my advice to any one who will take it is, "don't wander."

However essential it is that a good process be chosen, it is more essential that what is to be "processed" has some artistic qualities. For, after all, it is the artistic part of most slides that is the most important. If you make your own negatives this, at least, is in your hands, and you have yourself to blame if the slides do reach the artistic high water mark. Don't blame the camera or plates for faults in this direction, as you have no right to be wasting money on either if you cannot form a picture with the first and retain it with the second. As a rule, a negative which yields an artistic paper positive will also give

a successful lantern transparency

if you give it a chance.

But how can a picture, carefully arranged on an oblong quarter-plate—arranged with care in every corner so as to form an artistic whole—be equally perfect when one point of the pictorial balance has been cut off, and the remainder squared by a contact slide?

Making slides by contact is, I know, easier than by going through the process of reduction, but surely the production of a transparency which will be magnified to a 12 feet square, and that before an audience, is worth a good deal more trouble than a single paper print. "What is worth doing is worth doing well," and just as you strive to raise the pictorial value of every slide, so will the pleasure of slide-making increase.

As important as the above is the artistic qualities of commercial slides. Although in the actual process of production you have no say, yet it is your privilege to choose the good ones and reject the bad. The public did not always have this privilege, for the selection was, until recently, so small that choice had very narrow limits. If the view of Westminster Abbey did not please you, you had just to pass on to the Houses of Parliament, but now when you ask the shopman for a slide of the Abbey, he spreads out a dozen, taken from as many different standpoints.

Of course, all parts of the world do not yet offer the same choice in selection as the sets of London. For instance, there is not likely to be two different commercial views of the Gil Blas Inn, at Astorga, even though you stayed there two nights when on your "tour in Spain," and if the dealer's only slide is a poor one, let him keep it.

The public do not want

mementos of your travels, they want pretty pictures, and even though they have to go home without seeing the gable of the hotel at which you spent two nights, they will survive it! Yes, it is quite true, what the travel-lecture audience want is well-coloured pretty pictures, and what many an audience gets is a series of mementos, intensely interesting to the lecturer, but sometimes rather monotonous to other people.

(*To be continued.*)

Architecture as a Subject for Lantern Slides.—No. V.

By T. PERKINS.

ONE great lesson that we must learn before setting about interior work is not to attempt the impossible. Here is a case in point: I want to get a photograph of a south doorway underneath a projecting porch, taking in part of the pavement in front of the door. Now, if I go there when a bright sun is shining, I have in the same picture part which is practically an exterior view, part that may be regarded as an interior, well or fairly lighted as the case may be. The correct exposure for the pavement on which direct sunlight falls may be a second, while to get out the detail of the roof of the porch and the upper part of the doorway, possibly a minute, perhaps even two may be needed. What must I do? No compromise would be of any use, for that would only end in one part of the plate being spoilt by over, the other by under exposure. The wiser plan will be to wait for better lighting. A dull day when the contrasts will be less marked will give me **a far better chance** of getting a satisfactory negative; or advantage may be taken of a winter day when the snow is on the ground and the light is not too strong. Similar difficulties will be met with if attempts are made to photograph objects inside a building lit by sun rays falling through clear glass windows if any dark objects are included in the picture. Great consideration must be used in selection, and also if our time is limited—say, to a single day — we must so arrange our work that we may take the different parts of the building in such order that we get the most favourable lighting for each view chosen. Where time is an object, as it often is, **a second camera** (I often borrow one of a friend when setting out for a single day's work) is a great convenience, for one may leave one camera in which a plate is being exposed on some dark interior object, and go outside with the other to secure some detail which at that time is at its best as far as lighting is concerned.

It will be, perhaps, most instructive if I give an outline of my method of procedure when undertaking the photographing of some special building. In the first place be it observed that I do not go out haphazard on the chance of finding subjects, but only visit a church with a camera when I have a reasonable expectation of finding some good architectural features in it. I then find out all I can about it from county guide books, the Post Office Directory, or any other sources of information on which I can lay my hands. The saint to which the church is dedicated is a matter not to be overlooked, as this will probably enable us to determine beforehand the position of the church with respect to the points of the compass, for the so-called East end does not always face the east, but that part of the horizon from which the sun is seen to rise on the feast of the dedication. Hence a church dedicated to St. Barnabas, whose festival is on June 11th, which—until the change of style ordered by Pope Gregory XIII in 1582, but not introduced into England until 1752—was the longest day, will differ greatly in orientation from a church dedicated to St. Andrew or St. Thomas the Apostle (or, as is more frequently the case in England, the murdered Archbishop of Canterbury), or St. John the Evangelist, whose festivals occur near the shortest day. Hence, if we wish to get the eastern face of the chancel of a St. John the Baptist's church lit by the sun, we must get to it considerably earlier than if it were dedicated to the Evangelist of the same name. I put down **in my note book** all points of interest in the building that I find mentioned in any of the books consulted, and on arriving at the building, unless I find that some particular exposure must be made at once, I spend some little time in examining the building inside and out. Occasionally one meets with an intelligent sexton or verger who will point out things of special interest, and will afford facilities for photographing by suggesting the removal of objectionable objects, such as chairs or benches concealing the bases of pillars, or vases of flowers on the altar hiding the carved work of the reredos.

Occasionally the rector, from whom as a rule it is well to get permission to photograph inside the church, will come and help the work, though sometimes, with the best intentions, he may **prove a hindrance,** getting one into a conversation or taking one away from the camera to see something in a remote part of the building, and so preventing the lens being recapped at the right moment. As a rule, I find the clergy welcome the visit of the photographer, and I have never, save on one occasion, had any obstacles thrown in my way.

Having examined the church, I set to work. Any views that require the camera to be pointed towards the west or south-west are the first to receive attention; those looking towards the east or south-east I reserve till later in the day; those looking towards the north may generally be done at any time. General views, say, of the whole church interior looking from west to east, or from east to west, are generally rather commonplace, so that as a rule I avoid them. A view taken from the corner of an aisle looking diagonally across the building, or one looking north or south pleases me much better, for these are seldom taken for purposes of sale. But I rejoice most of all in detail work, for such is even more rarely met with in commercial slides. If I want to

take a piece of carving

on a flat wall, a canopied tomb, a niche, a piscina, a doorway or a panel, I prefer to place the camera straight in front of it, rather than to direct the lens obliquely at it, for such subjects I think look much better in parallel than in angular perspective. I avoid, as a rule, all subjects in which there are very great contrasts, white stone in sunlight and dark oak in shadow, for instance, for such a wide range of illumination cannot be well represented on one plate. I find that bright windows are often a trouble, for though backing the plates or using anti-halation plates reduces or entirely gets rid of halation, yet the windows may be over-exposed even to the extent of reversal before the remainder of the picture is done. If, therefore, they are of white glass, I do my best to exclude them from the picture, but I have found that this of itself is not sufficient, for if an image of a bright window is formed by the lens upon the inner walls of the camera, especially if it falls on the edges of the dark slide, which are perpendicular and close the plate, light is apt to get reflected on to the plate. I have had several pictures spoilt in this way, so now I take care to get the window well outside the angle included by the lens, and I find it well also to screen the lens from light falling obliquely on it, as this, too,

may cause a general fog.

A piece of bent cardboard placed on the top of the camera, supplemented, if necessary, by the focusing cloth, will generally be sufficient for this purpose. This precaution is specially necessary when taking any object that stands below a window; the altar reredos below the east window, for instance. As patches of bright sunlight on floors or walls or pillars are apt to be over-exposed, I generally reserve all views in which these occur until a day when the sun is veiled by clouds, or wait until the sunlight has passed away from the particular object I wish to take.

(*To be continued.*)

The Lanternist's Practical Cyclopædia.—No. V.*

By **CHARLES E. RENDLE.**

Candle Gas.—The gas given off by the light-giving waxes upon raising their temperature. The experiment which demonstrates this is so simple, harmless, yet beautiful, that it is worthy of mention. For the first few seconds after lighting the candle, both flame and light is all but lifeless, especially when the weather is cold; but as soon as the sperm or waxes warm and melt the high temperature draws the gases from those fats or waxes, the gas rushes through the wick, feeds the flame, and by this means the illuminant increases, and is kept up by the constant flow of the gas until the candle is consumed. Everyone knows that when the candle is blown out traces of smoke are seen to leave the wick, but those traces of smoke contain also the gases that are escaping from the liquid wax. To test this, hold in one hand a lighted match or taper; next blow out the light, and immediately hold the flame in the coil of smoke escaping from the candle. The gas will ignite, and at once light up the candle again.

Candle-power.—The determinate in this country that has been adopted for the gauging or measurements of the power of luminosity of an illuminant is a sperm candle of the size known as sixes. This candle burning under normal conditions consumes in one hour 120 grains of sperm, and the light given is known as one candle-power. The analysis of this candle proves the percentage of its three constituents to be carbon 80·0, hydrogen 13·3, oxygen 06·6; and on perfect combustion in the air the 120 grains yield 0·41 of cubic foot of carbon dioxide, and the same volume of water vapour per hour, for every candle-power illumination obtained by burning sperm candles.

Canting Table.—A platform upon which the lantern may be fixed, and then inclined to any required angle.

Carat.—A weight of four grains.—*See* also alloy.

Carbide.—The combination of carbon with a metal.

Carbon.—A non-metallic chemical element, existant in three distinct and different forms: diamond, graphite, and amorphous carbon. The purest form of carbon is the diamond, graphite is next in order of purity; whilst the third, consisting of charcoal, coke, lamp-black, etc., contain other substances besides carbon. In a state of combination, carbon is everywhere in Nature. It is an absolute constituent of all animal and vegetable products, and in the mineral kingdom is found in limestone and many other rocks, which form carbonates of various metals.

Carbon Dioxide or Carbonic Acid Gas was discovered in the seventeenth century, and fully investigated at the close of the eighteenth century. It is acknowledged to be a minor constituent of the atmosphere, and samples of air were taken from every part of the world with the same results, which were that it was present to the extent of from three to four volumes in 10,000 of air. It is formed during the decay or combustion of substances containing carbon. It is formed from the elements, carbon 12 parts, and oxygen 32 parts. For experimental purposes, it can be prepared by decomposing metallic carbonates, which hold it in combination. It is a clear colourless gas, and very heavy, its density being 22; indeed, it is by its weight that it is readily distinguished from nitrogen. Carbon dioxide becomes troublesome in ill-ventilated rooms, and more so in badly ventilated lanterns. The subject, therefore, is worthy of notice.

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Carriers for Lanterns.—The carrier is that accessory which carries the lantern slide to its registered position in the stages, and between the condensers and objectives. There are a variety of forms of adapters for this purpose. The simplest perhaps is the first, or one of the first, that was brought into use, consisting of a frame of wood, so constructed that a slide was inserted at one end, then a second which pushed the first into the centre of light, then a third which caused the second to take the place of the first, and so on. A carrier of this description fed from one end and emptied at the other is a true panoramic one, and when made exact the length of three slides, side-by-side, viz., 9¾ inches, the middle picture will always be found to be central. Many automatic improvements to the above are made from time to time, too numerous to name here, any of which can be seen at the dealers. For double and triple lanterns, the old form of frame carrier is rapidly being superseded by others, whose more perfect registration arrangements are appreciated by both professional and amateur alike. The lightning carriers—and their names and specialities are legion—are all constructed with the same objects in view, that of changing the slide, or view on the screen instantaneously, and in this particular they are perfect. One of the latest additions and introductions for favour in this line is called the Pneumatic Carrier, which is a very clever invention. The lens of the lantern is hooded with an instantaneous shutter, and by simply squeezing the rubber ball the slides are changed, and the shutter acts simultaneously.—*See* also Automatic Carrier.

Cathode. — The pole negative by which the electric current leaves.

Celluloid.—A compound of cellulose, and manufactured for a variety of purposes, in taking the place of ivories, coral, etc. It also plays an important part in photographic films, owing to its transparency when made in thin sheets. It can be rendered soft at 196° F., at which temperature it can be moulded into any form. It is highly inflammable, decomposing at 266° F.

Centigrade.—Breaking up into one hundred parts. The Centigrade Thermometer is divided between the two points into 100 degrees, the freezing point being 0° C., the boiling point 100° C. This thermometer is used by scientific men all the world over, its general use is adopted on the Continent, whilst the Fahrenheit is mostly used in this country. An easy and useful method of arriving at the corresponding temperatures of either one of the above to the other, is, convert Centigrade to Fahrenheit, multiply by 9, divide by 5, add 32. Fahrenheit to Centigrade, substract 32, multiply by 5, and divide by 9. Example, boiling point 100° C., 100 × 9 ÷ 5 + 32. 212° F.

Centigraphic Lantern.—A term given to an instrument, the specialities of which are facilities for changing any number of slides by the lecturer himself, although he may be a considerable distance from the apparatus, by means of an automatic contrivance attached to the lantern and compressed air.

Centering Light.—Unfortunately, this is a point too often neglected by the novice, and in consequence, bad results are produced which he cannot understand. On the other hand, the more practical hand tells at a glance if anything be wrong with the position of an illuminant. The light can be best centered with a clear disc, when the fault, if any, is at once apparent; should a halo of bluish tint encompass the circle, the light is in too close proximity with the condenser, where shadows appear, the light must be moved in the contrary direction, thus, the top of screen is shadowed, lower the illuminant until the shadow disappears, or dark patches show to the left, the light must go to the right. The subject is an important one, and pictures are often robbed of their beauty in consequence of non-attention to it.

Chemistry.—The science which governs the study of the properties of the various forms of matter, the elementary bodies and their combinations, etc. By the aid of this science we are able by practical experiment to divide substances into two classes, compounds and elements, the former which can be broken up into two or more distinct substances, and the latter, which cannot be broken up or separated, so as to differ from anything but themselves. A mechanical mixture differs from a chemical, in the degree that the mixture can with ease divide its constituents, whereas, the constituents of a compound are so combined that considerable difficulty is often experienced in dealing with it, it having assumed certain properties. As a simple example of this branch of chemistry, we mix together in equal proportions some brass and iron filings, this is a mechanical mixture, which at once divides its constituents by passing a magnet through; but suppose instead of disturbing the metals in this way we melt them together, so soon as the temperature is raised to the fusing point of the metals, chemical action sets in, and continues so long as the temperature is kept up, the brass and iron unite and form a compound, which is unalterable, except by a complicated series of chemical experiments. All arts and manufactures have their chemistry—organic chemistry, the analysis of animal and vegetable matter; inorganic chemistry, the analysis of physical compounds. The subject is so extensive, readers are referred to the various works, such as "Watt's Dictionary of Chemistry," "Chemistry Applied to Arts, Manufactures," etc.

Chemical Tank. — A receptacle constructed to hold chemicals, and various other liquids, for scientific demonstration in the lantern. It is generally made in carrier form, and placed in the same position in the lantern stages, between the condensers and objectives.

Chloride of Sodium.—Common salt.—*See* Chlorine.

Chlorine.—A yellowish green gas, principally obtained from common salt. It is a chemical element, two and a half times as heavy as air, and of a choking odour. The properties of chlorine are very vigorous, combining readily with many other elements. It enters at once in combination with hydrogen, thus forming hydrochloric or muriatic acid. A compound of chlorine with another element is termed a chloride, so that common salt, which is a compound of chlorine with sodium, is chloride of sodium. The chlorates are held in high value, in consequence of their readiness to evolve oxygen, thus chlorate of potash is the factor, mostly used for the preparation of oxygen gas, fireworks, etc.

(To be continued.)

The Invention and Development of the Optical Lantern.

By EDWARD DUNMORE.

CHAPTER XII.

A LANTERN for exhibiting solid objects, termed the aphengoscope, is an arrangement by which a powerful light is thrown on the object, which is reflected by the aid of a mirror into the lens, and then projected on to the screen. There is a considerable loss of light by this method of exhibition, so that the most powerful light possible has to be used.

New instruments have been recently introduced by a number of different firms in which the figures, etc., appear moving as in reality. A similar effect was produced by Mr. Friese Green some years since. A large number of slides are taken per second, showing different phases of movement, and passed through the lantern at about twice the rapidity with which they were originally taken, persistence of vision resolving the many phases of action into one continuous one, with excellent effect. These instruments have become very popular, and are exhibited under a variety of names.

The lantern microscope as devised by Mr. Wright, and manufactured by Newton, of Fleet Street, also by Chadwick, for projecting microscopic preparations direct on the screen is an effective apparatus. Very high power object glasses can be used, the amplification is almost unlimited, and the definition good. Other makers have recently introduced excellent apparatus of the kind.

When so small an objective is used, the light must be the most powerful obtainable, and increased by the use of

two condensers.

On account of the heat evolved by the limelight, it is requisite to place an alum tank between the condenser and the slide, but the electric arc lamp is far and away the best when available, as the alum tank can be dispensed with. An important addition to the optical lantern is the vertical attachment, which is used for displaying objects laid flat on a horizontal glass table, beneath which is a condensing lens. A sloping mirror reflects the light from the lantern through the condenser and superposed objects into the objective, the image being once again reflected on to the screen. This arrangement, although it absorbs a good quantity of the light which should be the most powerful procurable, provides an excellent method of exhibiting the crystallisation of various salts; a little of a saturated solution being spread on the glass support will, as it evaporates, produce the most beautiful effects of crystal formation, and the development of a photographic image in a shallow glass tray can be easily shown. With reference to crystals, a polarising apparatus attached to the lantern will produce the most brilliantly coloured images on the screen, and perhaps no substance gives a more beautiful result than hippuric acid, being very easily crystallised, but salts may be used with characteristic and varying effects. Many easily obtainable ones are as effective as the most rare, such as the chloride and sulphate of ammonia, soda, potash, magnesia, etc. Most opticians supply the necessary apparatus, and some few make a speciality of it, as they do of lantern apparatus generally.

(To be continued.)

NEW APPARATUS.

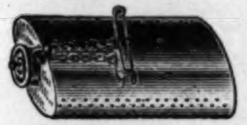
NEW KODAK CAMERAS.

The Eastman Photographic Materials Co., Ltd., are bringing out two new forms of the Kodak series of hand cameras termed the "Bull's-Eye" and "Bullet" Kodak cameras. The former is for use with films only, and the camera can be loaded in daylight. Each roll of film will take twelve negatives, 5 by 4 inches. Let into the body of the camera are two sockets, so that it may be attached to a stand, so that either vertical or horizontal pictures may be taken.

The lens is achromatic, and is provided with a set of three stops, also a rotary shutter which is always set ready for an exposure. The "Bullet" camera is somewhat similar to the one above described, at least, in outward appearance, but it can be used either for films as before-mentioned, or employed for glass plates, the change being effected in a few seconds. The former camera weighs 2¼ lbs., and measures 5 by 5⅞ by 9¼ inches; and the latter weighs 3 lbs., and measures 5¼ by 6⅛ by 9¾ inches. Both are supplied with two view finders.

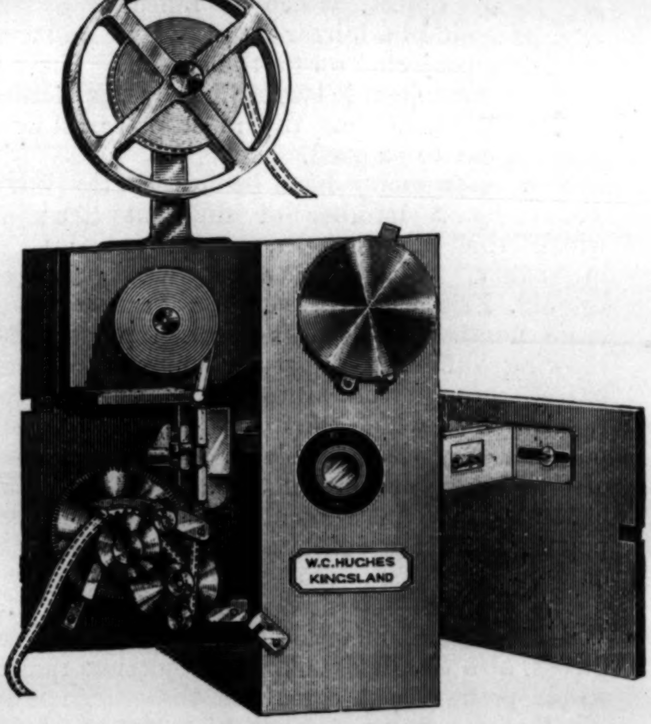
INSTRA WARMERS.

Although brought out for an entirely different purpose, the lanternist will find this useful in connection with his exhibitions. When slides are placed cold in the lantern, the moisture will condense on the surface of the glass, and produce for a time objectionable patches on the projected picture; but by placing one of the Instra warmers in the slide box, say, when leaving home, the slides will be gradually warmed by the time they are required. Of course, it is a simple matter to warm the slides before use at a fire, but in the majority of halls this is impracticable. The Instra is a silver-plated case 4½ by 1¼ inches, and of the shape shown in the illustration. To charge it, one of the cartridges supplied is first lighted by a match, and when it begins to smoulder it is placed into the Instra at the screw cap shown at the top, and it will then gradually give out heat for about two or three hours. The refills or cartridges cost only 1s. 6d. for 50, post free. The appliance is brought out by Messrs. D. Blair & Co., 47, Cannon Street, London, E.C. No odour is given off.



MOTO-PHOTOSCOPE.

Unlike the various appliances on the market for projecting animated photographs, the Moto-photoscope introduced by Mr. W. C. Hughes, of Kingsland, is not provided with any shutter, consequently the blinking effect is to a large extent overcome, and as there is no shutting out of the light, the image on the screen appears of even luminosity. On reference to the illustration, it will be seen that the film is not drawn forward by the spocket wheel, but by a species of cam. The mechanism, which is extremely simple, is fastened to the door of the box so that when changing a film it is readily get-at-able by the door being swung open. When several films are joined end to end, the large spool is used, but for single films the smaller is employed. The film is passed between adjustable guides (so as to ensure accurate steadiness with films that may vary in width to a small extent), then under the cam and over the spocket wheel, which latter serves as a make-fast during the time that the cam is bringing forward the necessary amount of film for the respective pictures. The motion is very smooth, and the mechanism is made with such exactitude that the pictures present a perfectly steady appearance upon the screen.



Either short or long focus lenses can be employed, there being provision made for securing them in their respective positions. By an ingenious method, a small carrier is affixed on the door opposite to that to which the mechanism is attached, so that when the latter is opened, as in the changing of a film, the other can be closed so to at once bring a small picture into its correct position, so that the screen need never be left without a picture. Each revolution of the driving handle causes eight or nine pictures to be projected, so it will be seen, that when desired, great speed can be attained in the changing of the various figures that go to make one complete scene. During some recent trials with this apparatus, we were well pleased with the results attained.

ACETYLENE.

To the long list of apparatus invented for the manufacture of acetylene must be added the new automatic generator, invented by Mons. A.

Cerckel (France). This apparatus consists of a generator containing calcium carbide, which is placed in a series of superposed baskets; this generator is united at the lower part to a water-tank, and at the top part to a gas-holder, of which the holder in its ascensional motion comes into contact with a lever working a cock which governs the entrance of acetylene into the holder. The lower part of the generator is conical, and contains an india-rubber ball which floats on the water and acts as a valve. The water flows from the tank into the generator, raising this ball, then when the holder is full, the cock being automatically shut, the pressure in the generator increases and drives the water back into the tank. The india-rubber ball then comes to rest, and is applied by the pressure to the seat constructed for this purpose at the base of the generator.

This very simple arrangement, entirely automatic, prevents the acetylene from escaping by the pipe communicating with the tank; and also avoids one of the most common inconveniencies in most apparatus hitherto invented by separating the tank-water from the calcium carbide; thus the carbide is not attacked by water vapour when this water has been driven beyond the carbide. When owing to consumption the holder is sufficiently exhausted, the cock again opens and the acetylene passes from the generator into the holder. Finally, when pressure in the generator is less than that exerted by the tank-water the valve ball rises, water enters the generator attacking the carbide, and the series of operations recommences.

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PATENT INTELLIGENCE.

The following List, relating to current Patent Applications, is compiled expressly for the "Optical Magic Lantern Journal" by W. P. Thompson & Co., Patent Agents, of 322, High Holborn, London, W.C., to whom all enquiries for further information should be addressed.

No. Recent Patent Applications.

139. 2nd January, 1897. F. Trendal and J. Mücke. Process and apparatus for producing acetylene gas. Complete.

160. 4th January, 1897. W. J. Holme. The limelight incandescent mantle.

212. 4th January, 1897. P. Gautier. Improvements in intermittently moving apparatus for taking or displaying photographs. Complete.

328. 5th January, 1897. J. Zimmerman. Improvements in processes of, and apparatus for forming and burning acetylene and similar gases. Complete.

413. 6th January, 1897. C. Stafford-Noble. Improvements in apparatus for taking and projecting successive photographic pictures.

449. 7th January, 1897. W. C. Hughes. Improvements in connection with projecting lanterns. Complete.

454. 7th January, 1897. G. Dowrie. Improvements in or relating to electric arc lamps for photographic or other purposes regulated by hand.

638. 9th January, 1897. C. D. Slater. An improved device for the production of optical illusions.

886. 12th January, 1897. J. H. Smith. Improvements in apparatus for taking, copying and projecting living photographs.

989. 13th January, 1897. J. Reignier. Improvements in apparatus for obtaining or exhibiting chromo-photographs.

991. 13th January, 1897. H. J. Dowsing. Automatic apparatus for producing X rays and showing their effect on a prepared plate or screen.

1039. 14th January, 1897. T. van H. Obelt. An improved machine or apparatus for projecting kinetoscopic pictures.

1216. 16th January, 1897. T. van H. Obelt. A combination mechanical photographic camera and reproducer.

1569. 20th January, 1897. R. E. Gill. Improvements in mechanism for taking a series of instantaneous photographs upon a continuous band or film and for projecting the same upon a screen.

1610. 21st January, 1897. H. S. Pyne and A. Elsee. An electrical dissolver and slide-changing apparatus for optical lanterns.

1676. 21st January, 1897. C. A. Lee. Improvements in and additions to apparatus for the production of animated photography.

1808. 23rd January, 1897. J. Pumphrey. Improvements in the means for, and mode of taking and reproducing moving and stationary pictures.

1950. 25th January, 1897. F. P. Liesegang. Improvements in or connected with optical projecting apparatus. Complete.

2204. 27th January, 1897. C. P. Copp. Apparatus for projecting living pictures.

2260. 28th January, 1897. F. S. Thorn and C. Hoddle. A new and improved acetylene jet for optical lantern use.

2262. 28th January, 1897. F. S. Thorn and C. Hoddle. A new and improved lantern view dissolver for acetylene gas.

2574. 1st February, 1897. J. Akroyd and B. Akroyd. Acetylene gas generator.

3097 5th February, 1897. A. V. Wastley. Improvements in apparatus for photographing successive pictures of moving objects upon a moving strip of transparent film, and for projecting pictures so taken.

3572. 10th February, 1897. G. Haydon and Haydon and Urry, Limited. Improvements in and relating to apparatus for obtaining and displaying chromo-photographic or zoetropic pictures.

3722. 10th February, 1897. W. P. Thompson. (The firm of C. W. Kayser and Co.) Improvements in grooved frames, carriers, or supports, for holding or suspending accumulator plates, photographic plates, and other plate-like articles.

RECENTLY-PRINTED SPECIFICATIONS.

Copies of the following specifications may be obtained by remitting 1/- for each specification to W. P. Thompson & Co., Patent Agents, 322, High Holborn, London, W.C.

14628 of 1896. Lehman. Washing photographic plates and prints.
24982 of 1896. Dunn. Colouring photographs.
1332 of 1896. Luis. Acetylene gas production.
3219 of 1896. Pym and Gore. Acetylene gas production.
869 of 1896. Jeffrey. Photographic cameras for taking panoramic views.
4548 of 1896. Stedmann. Oxygen gas production.
4686 of 1896. Paul. Apparatus for projecting kinetoscope pictures on the screen.
22648 of 1896. Bourne. Construction of ventilators for lanterns and other purposes.
27697 of 1896. Lake (Hanotier and Hostelet.) Acetylene gas generators.
18904 of 1896. Fried. Photograph changing stereoscope.
26987 of 1896. Schmitt and Schmitt. Lanterns.

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Correspondence.

CHEMICALISED LIMES.

To the Editor.

DEAR SIR,—As a reader of the LANTERN JOURNAL, may I ask if it is within the bounds of possibility to produce a chemicalised lime, which will give an incandescent light when used only with house-gas?

It seems to me that what is most wanted, is the minimum of trouble and risk with the maximum of light for amateur operators, so as to dispense either with the objectionable oil lamp or the heavy oxygen gas cylinder.

Shall be much obliged if you will either express your opinion on this point, or permit of its ventilation in the columns of your paper.

Thanking you in anticipation, and with all good wishes.

Yours sincerely,
ROBERT W. STEWART.

Lansdowne Road,
London Fields, N.E.
February 1st, 1897.

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Notes and Queries.

City Missionary.—With regard to illumination, speaking from memory, we should place them in the following order, 4, 1, 2, 3. Economy practically about the same. Safety, 3 and the others about equal.

W D. Askew.—The set will not be published until the present lecturer has had the first innings; if he published them before it would cut the ground from under his feet, to the tune of several thousands of pounds.

G. M. I.—From Messrs. Schott & Genosser, of Jena, Germany.

L. (New Zealand).—The price of the Gwyer jet suitable for lantern work is £3 5s. 6d., and those for theatrical work by the same makers are £2 15s. We cannot say why the makers do not publish the prices in their advertisement, but we, like you, think it would be to their advantage.

H. T. Morton (U. S. A.).—Not knowing how much you know upon the subject, it might be necessary to write several pages of instructions, but if you will put your queries in definite form we shall be pleased to give the matter our attention. As it is, it is difficult to determine whether you want instructions with regard to the electric light, or the material on which to produce an enlargement. You will kindly note that our address has not been Chancery Lane for over a year. See the address in journal.

J. K. Mackay.—(1) 10 or 12 feet of oxygen will suffice for the 2 hours, with the jet mentioned. (2) For price see particulars to L. above. (3) We have not yet had an opportunity of trying the Manchester Oxygen Company's jet, although the proprietors promised this last month, but we have heard very good accounts of it.

R. M.—We fear such a patent could easily be got round. Anyhow, take out a provisional specification before submitting it to the parties.

Jas. T. Smart.—There has been some little difficulty of late in dealers getting supplies of calcium carbide, but there seems every reason to believe that arrangements are being made to prevent this in future.

Adjustment.—You can get over your troubles by having a cut-off tap, fixed on the metal tubing at the back of the lantern; in this way you will be able to turn off the gases during any interval, without in any way interfering with the adjustment taps of the jets.

Wm. Marwick.—Sorry we cannot insert your letter, as it will do no good.

G. S.—Do not send the apparatus for us to see; we will take your word for it that it is not in working order; why not send it back to the firm from whom you purchased it, they will change it if there is anything the matter with it, without your being backed up with any such certificate, such as you suggest from us.

E. & H. S. Anthony.—Your editor omitted to acknowledge the article on page 42 of your magazine, which was copied from this journal for January.

H. M. Gear.—(1) 23 inches is correct. (2) The average sized gauze used for window blinds will answer. Lists of prices of the back numbers will be seen in advertisement columns.

Lucifer, Junior.—Dip a piece of flannel in hot water and wrap around the tubes, this should cause greater generation of vapour, or it is possible the stuffing may require drying; if such is the case, place the apparatus in a hot oven for a time, or perhaps the flannel is packed too tightly.

A. Brooker.—We understand that Messrs. Wrench and Son are exclusive agents for the trade.—Write them.

W. Pilkington.—See the first advertisement under our general columns. The advertiser makes a speciality of such as you enquire about.

Lanternist.—In our back numbers you will find plenty of details respecting the working of saturators. Your trouble can be got over if you will open all the valves and set the apparatus in an oven, or on a gas stove, so as to thoroughly dry the stuffing.

Messrs. Tranter, Golding, and Hiddon.—In our next.

C. Kirkham.—Will insert letter in our next.

A. C. Barclay.—It would hardly be wise.

Church Army.—Your communication is an advertisement, and as such can only appear.